

MEE427 PID Control – Extraction of Motor Model with System Identification Procedure using Data Acquisition (DAQ) Instrument

Required equipment for system identification procedure:

1. Computer (LabView and necessary drivers should be installed before)
2. Data acquisition device (will be given in the laboratory)
3. DC Motor (will be given in the laboratory)
4. DC Motor Driver (will be given in the laboratory)
5. Power Supply (will be given in the laboratory)
6. Potentiometer (will be given in the laboratory)
7. Necessary connection cables (bunch of different types of jumper cables)

PLEASE FOLLOW THE STEPS GIVEN BELOW

The purpose of this work is to collect position data of a DC motor with given input voltage by using a potentiometer as a feedback device. Extracted input-output relation is used in revealing the motor model by using the system identification procedures.

A simple way to collect the required data is using LabView program and a DAQ device which is compatible with LabView. NI MyDAQ and NI USB-6009 data acquisition devices are compatible with LabView program (NI: National Instruments). These devices have Analog and Digital inputs/outputs, providing an easy connection to computer via USB cable.



Figure: NI MyDAQ Student and NI USB-6009 portable DAQ devices

The related quick start documents with the mentioned software and hardware are given below:

- <https://learn.ni.com/learn/article/labview-tutorial>
- <https://www.ni.com/en-tr/shop/hardware/products/mydaq-student-data-acquisition-device.html>
- <http://www.csun.edu/~rd436460/Labview/USB%206008%20Users%20Guide.pdf>

The software part should follow the steps in order:

1. Installing LabView
2. Installing NI-DAQmx (includes DAQ device drivers and LabView integration)

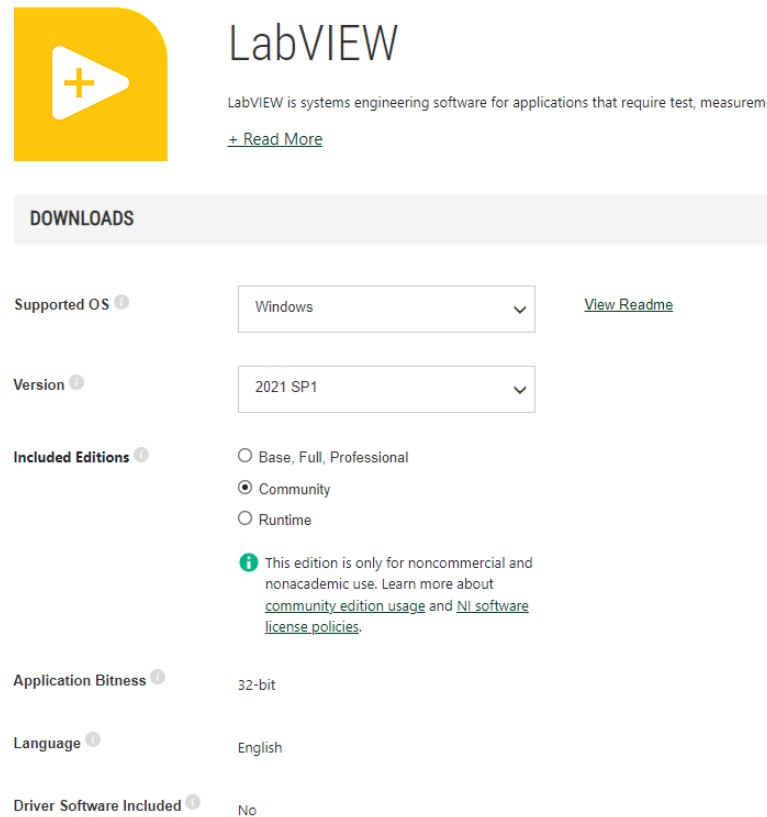
NOTE: 1) It is very critical to use compatible software versions.

2) Installing LabView program as 1st step is a must.

1. Installing LabView

NOTE: It requires an account to run LabView. If an account does not exist, sign up and create an account.

Download and install LabView from its official website. The version should be 2021 SP1 and the edition should be “Community” version (free version). The version number is decided through hardware compatibility chart. A verification screenshot from the install website is given below.



The image shows the LabVIEW download configuration page. At the top, there is a yellow square icon with a white play button and a plus sign. To its right, the text "LabVIEW" is displayed in a large, dark font. Below this, a smaller line of text reads "LabVIEW is systems engineering software for applications that require test, measurement, and control." followed by a link "+ Read More". Below this section is a grey bar with the word "DOWNLOADS" in white. Underneath, there are several configuration options: "Supported OS" with a dropdown menu set to "Windows" and a link "View Readme"; "Version" with a dropdown menu set to "2021 SP1"; "Included Editions" with three radio buttons: "Base, Full, Professional", "Community" (which is selected), and "Runtime". Below the radio buttons is an information icon and a note: "This edition is only for noncommercial and nonacademic use. Learn more about community edition usage and NI software license policies." Below this are "Application Bitness" set to "32-bit", "Language" set to "English", and "Driver Software Included" set to "No".

DOWNLOADS	
Supported OS ⓘ	Windows ▼ View Readme
Version ⓘ	2021 SP1 ▼
Included Editions ⓘ	<p><input type="radio"/> Base, Full, Professional</p> <p><input checked="" type="radio"/> Community</p> <p><input type="radio"/> Runtime</p> <p>i This edition is only for noncommercial and nonacademic use. Learn more about community edition usage and NI software license policies.</p>
Application Bitness ⓘ	32-bit
Language ⓘ	English
Driver Software Included ⓘ	No

<https://www.ni.com/en-tr/support/downloads/software-products/download.labview.html#443310>

Operations of NI-based programs (LabView and NI DAQ devices are included) like installation, update, remove, etc. are carried out using “NI Package Manager”. However, it is not recommended for this application due to software-hardware compatibility, the latest versions are not compatible with each other at this moment.

A brief LabView tutorial may be followed using quick start guide whose website link was given before.

2. Installing NI-DAQmx

Download and install NI-DAQmx from its website. The version should be “21.8”. The version number is decided through hardware compatibility chart. A verification screenshot from the install website is given below.



NI-DAQmx

NI-DAQmx™ provides support for customers using NI data acquisition and signal conditioning c

[+ Read More](#)

Note: Install programming environments such as NI LabVIEW or Microsoft Visual Studio® b

DOWNLOADS

Supported OS ¹

Windows

[View Readme](#)

Version ¹

21.8

Included Editions ¹

Full

Application Bitness ¹

32-bit and 64-bit

Language ¹

English, French, German, Japanese, Korean,
Simplified Chinese

<https://www.ni.com/en-tr/support/downloads/drivers/download.ni-daqmx.html#445931>

NOTE: Using DAQ device without LabView is also possible using NI-ELVIS program (NI-ELVISmx), providing a few working modes (not needed in this application).

DATA LOGGING STEPS

The purpose of the preliminary work on given DC motor is to determine the relation between the input and output. The procedure should be followed as below;

- One of the Analog inputs of the DAQ device should be connected to position feedback sensor (potentiometer).
- The measured voltage value should be converted to physical angle value in LabView (calibration procedure).
- The DC motor should be driven with a known input voltage and output angle should be logged by constructing a related LabView program via DAQ device.
- Input output relation should be logged by constructing a related LabView program via DAQ device.
- A connection schematics for DAQ device is given below.

